FemtoampSense Operation Manual

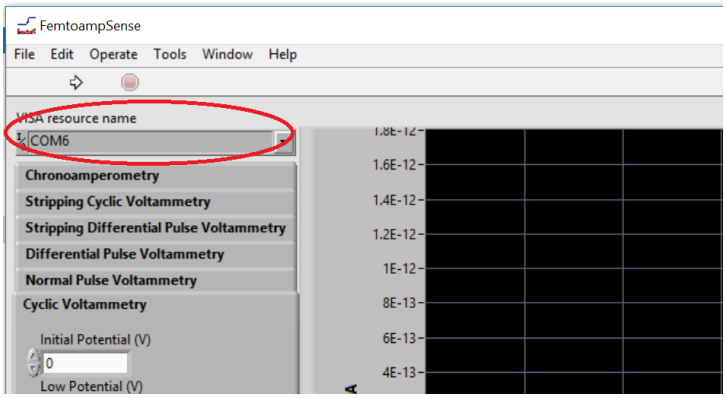
Table of Contents

Things you need to prepare:

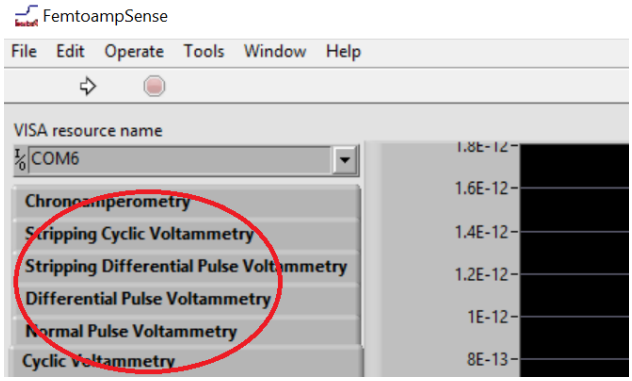
1) A stable platform to hold the instrument
2) A Faraday cage-at least 55cm x 40 cm x 25cm. An aluminum foil covered cardboard box can be used as the Faraday cage.
3) A stable power supplier with three outputs: +15-18V, -15-18V and ground. (Or four 9V batteries, if the positive output is below 15V, batteries must be changed.)
4) A computer/laptop with Windows 10 operation system.

To Begin With:

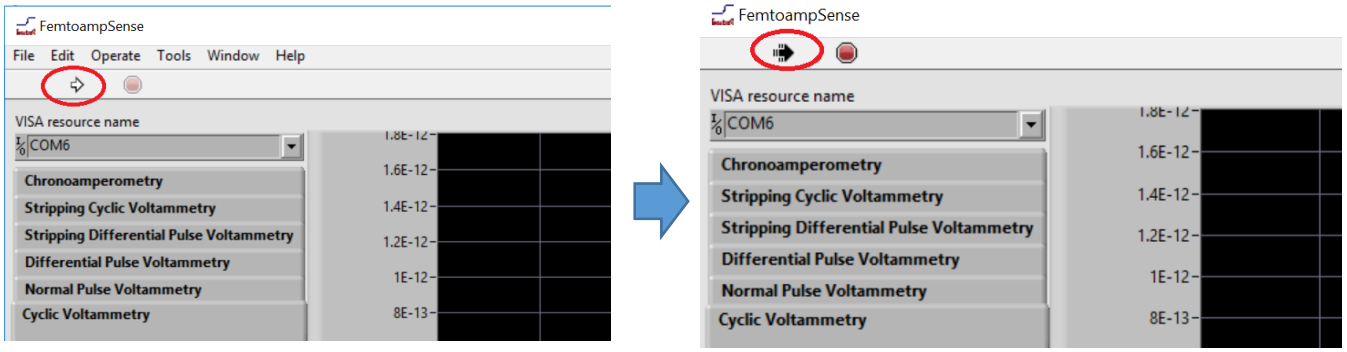
1) Install the operation software
2) Connect the instrument and the computer with a cable
3) Turn the instrument main power switch to “off”, plug the three outputs of the power supplier to its corresponding position then turn the main power switch to “on”.
4) Connect all three electrodes in an electrochemical cell,
5) Choose appropriate sensitivity by turning the rotary switch to the right position
6) Push the “reset” button on the rear panel until you hear a click, you will see the red light is on, wait for about 1 minute, then push the “reset” button one more time so that the red light is off.
7) Cover the entire instrument and your electrochemical cell in the Faraday cage
8) Open the instrument operation software, click the I/O box on the upper left-hand corner, choose com port that is connected to the instrument.



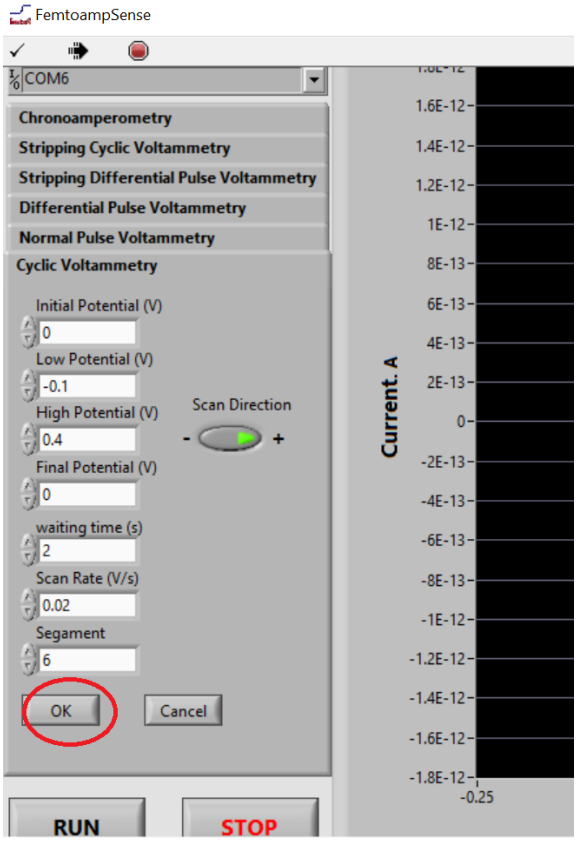
9) Choose techniques



10) Click the arrow so that it turns to black



11) input parameters, then, click “ok” to confirm the parameters or click “cancel” to re-input parameters

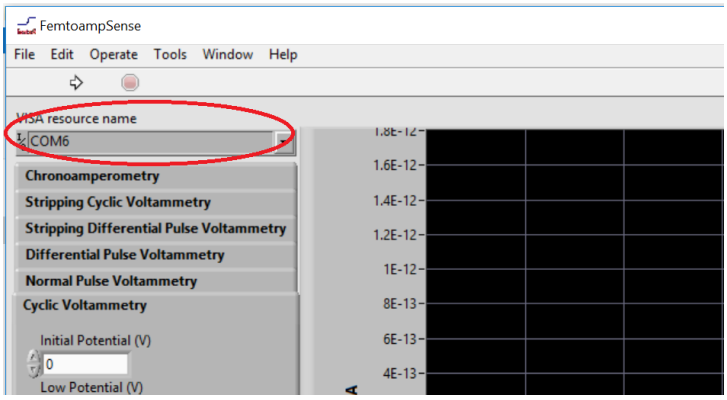


* If you want stop while the program is running, you can click “Stop” to stop the program, then, follow the procedure for “daily routine user” for your next run

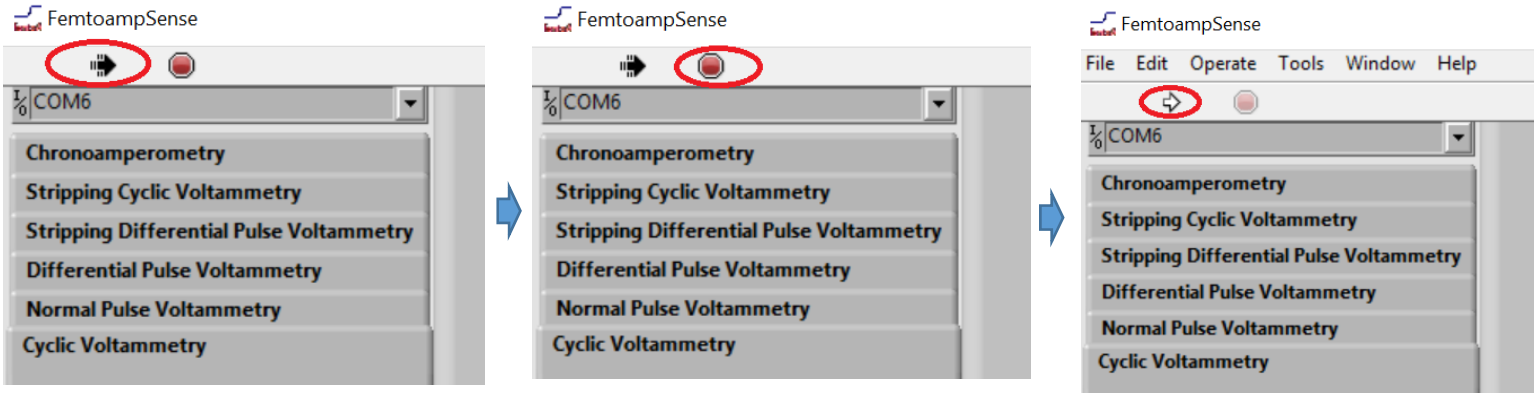
* If there is a current overflow, you must immediately click the “Stop” button to stop the program, then, switch to lower sensitivity, then, push the “reset” button on the rear panel until you hear a click, you will see the red light is on, wait for about 1 minutes, then push the “reset” button one more time so that the red light is off. Follow the procedure for “daily routine user” for your next run

For daily routine uses:

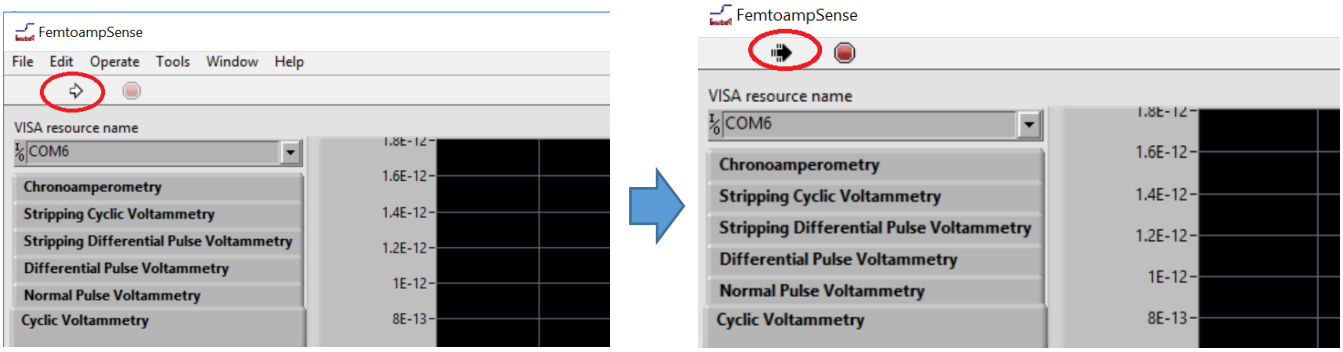
1) Open the instrument operation software, click the I/O box on the up left corner, choose com port that is connected to the instrument.



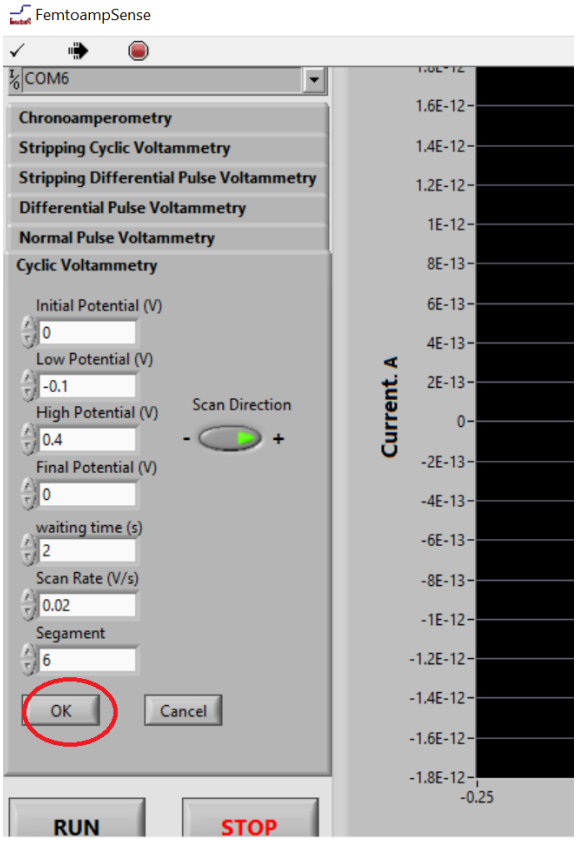
2) Connect all three electrodes in an electrochemical cell,
3) Choose appropriate sensitivity by turning the rotary switch to the right position
4) Push the “reset” button on the rear panel until you hear a click, you will see the red light is on, wait for about 1 minute, then push the “reset” button one more time so that the red light is off.
5) Cover the entire instrument and your electrochemical cell in the Faraday cage
6) If the arrow on the up left corner is black, click the red button to turn it into white



7) Choose a technique and Click the white arrow so that it turns blac



8) input parameters, then, click “ok” to confirm the parameters or click “cancel” to re-input parameters



9) Click “run” to run the program

* If you want stop while the program is running, you can click “Stop” to stop the program, then, follow the procedure for “daily routine user” for your next run

* If there is a current overflow, you must instantly click the “Stop” button to stop the program, then, switch to lower sensitivity, then, push the “reset” button on the rear panel until you hear a click, you will see the red light is on, wait for about 1 minute, then push the “reset” button one more time so that the red light is off. Follow the procedure for “daily routine user” for your next run.

Cyclic Voltammetry

Initial potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Low potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V. The low potential must be lower than the high potential

High potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V. but the high potential must be higher than the low potential

Final potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Scan rate: any value between 0.0005V/s to 1.0 V/s, increment 0.0005V/s

Segment: any value between 1 and 100, increment or decrement 1.

Waiting time: any value between 1 and 100, increment or decrement 1.

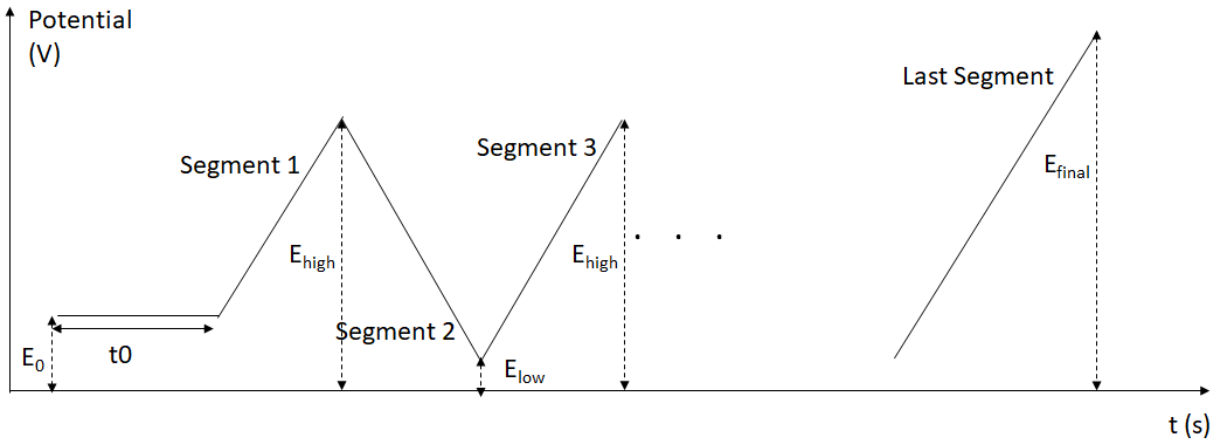


Figure 1 potential excitation wave in Cyclic Voltammetry. E_0: initial potential; t0: waiting time; E_{high}: high potential; E_{low}: low potential; E_{final}: final potential;

Chronoamperometry

Initial potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Initial Time: integer number between 1 and 255 increment 1.

Potential Step 1: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Potential Step 1 Time: integer number between 1 and 255 increment 1.

Potential Step 2: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Potential Step 2 Time: integer number between 1 and 255 increment 1.

Final Potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

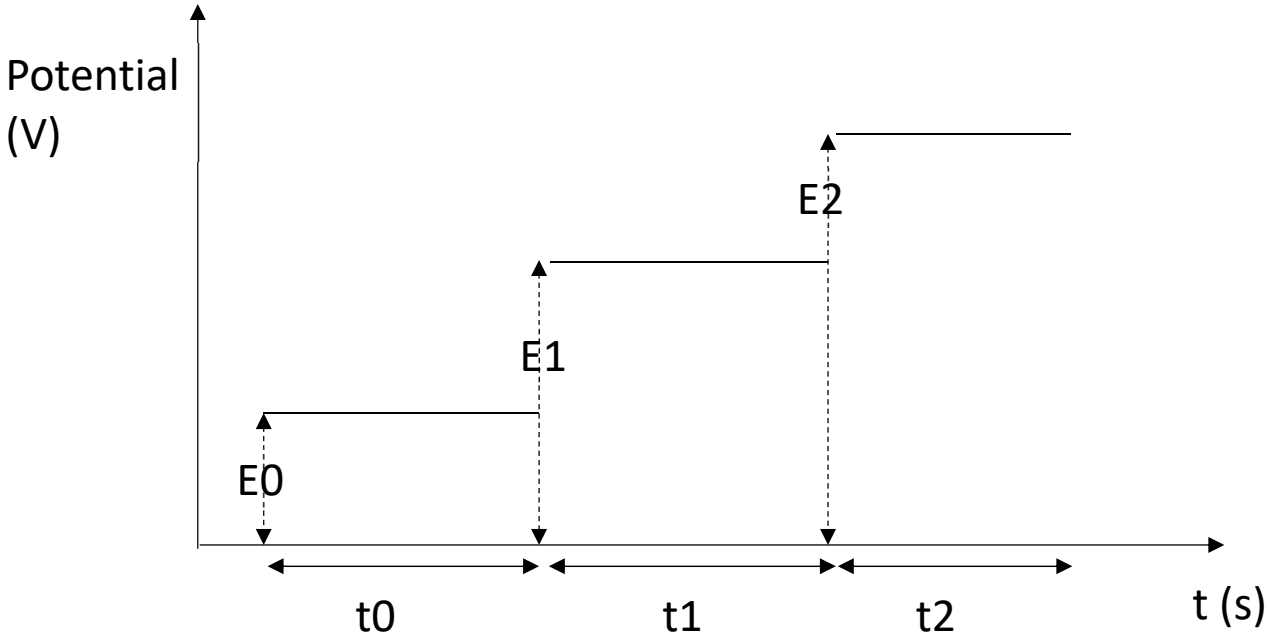


Figure 2 potential excitation wave in Chronoamperometry. E0: initial potential; E1: potential step 1; E2: potential step 2; t0: initial time; t1: potential step 1 time; t2: potential step 2 time.

Differential Pulse Voltammetry

Initial E: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Final E: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Step E: any value between 0.001 V and 0.100 V, increment 0.001V

Pulse Height: any value between 0.001 V and 0.200 V, increment 0.001V

Pulse Width: 50ms, unchangeable

Pulse Interval: 100ms, unchangeable

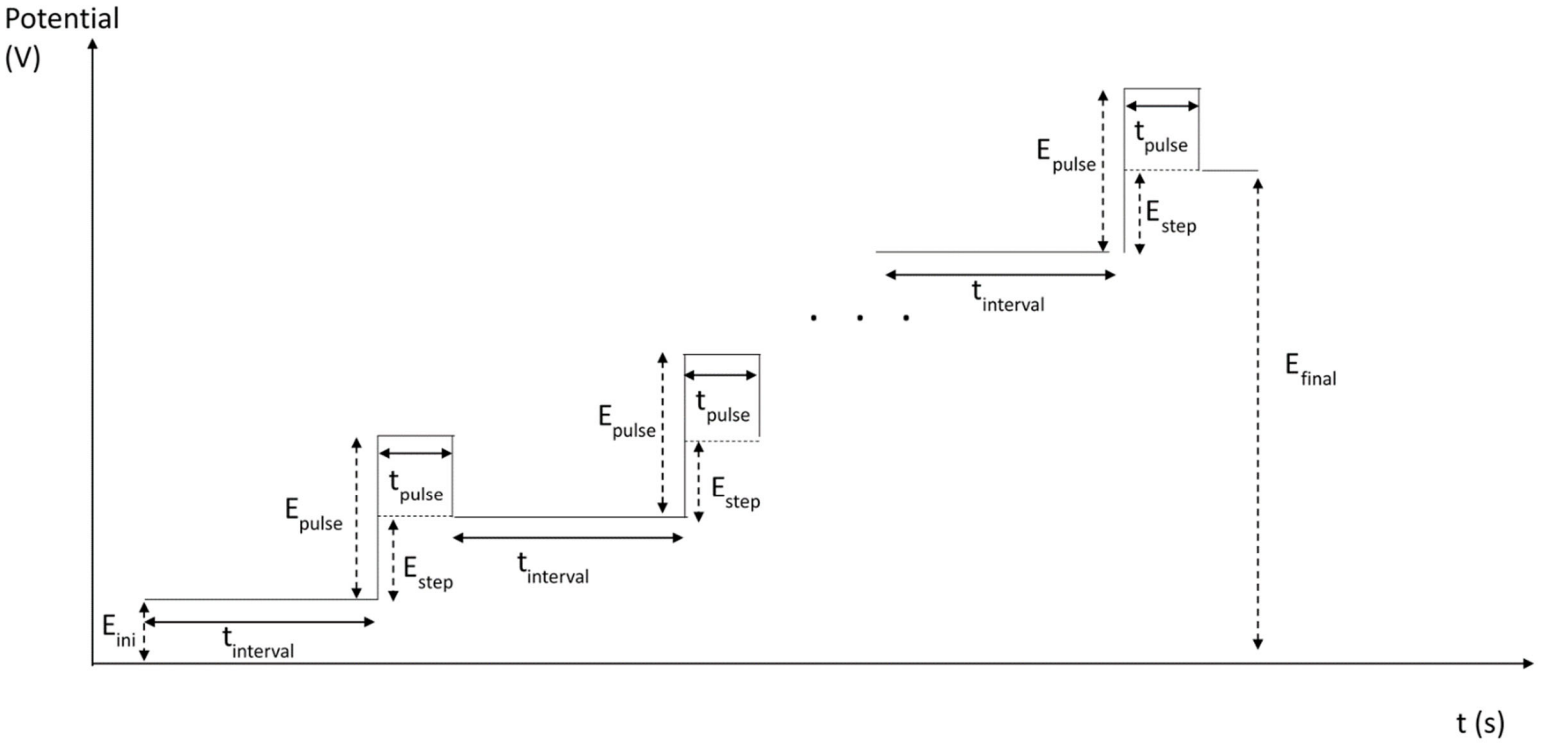


Figure 3 potential excitation wave in Differential Pulse Voltammetry. E_{ini}: initial E; E_{fianl}: final E; E_{step}: step E; E_{pulse}: pulse height; $t_{interval}$: pulse interval; t_{pulse}: pulse width;

Normal Pulse Voltammetry

Initial Potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Final Potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Pulse Magnitude: any potential between 0.001 V and 0.100 V, increment 0.001V.

Pulse Width: 50ms, unchangeable

Pulse Interval: 100ms, unchangeable

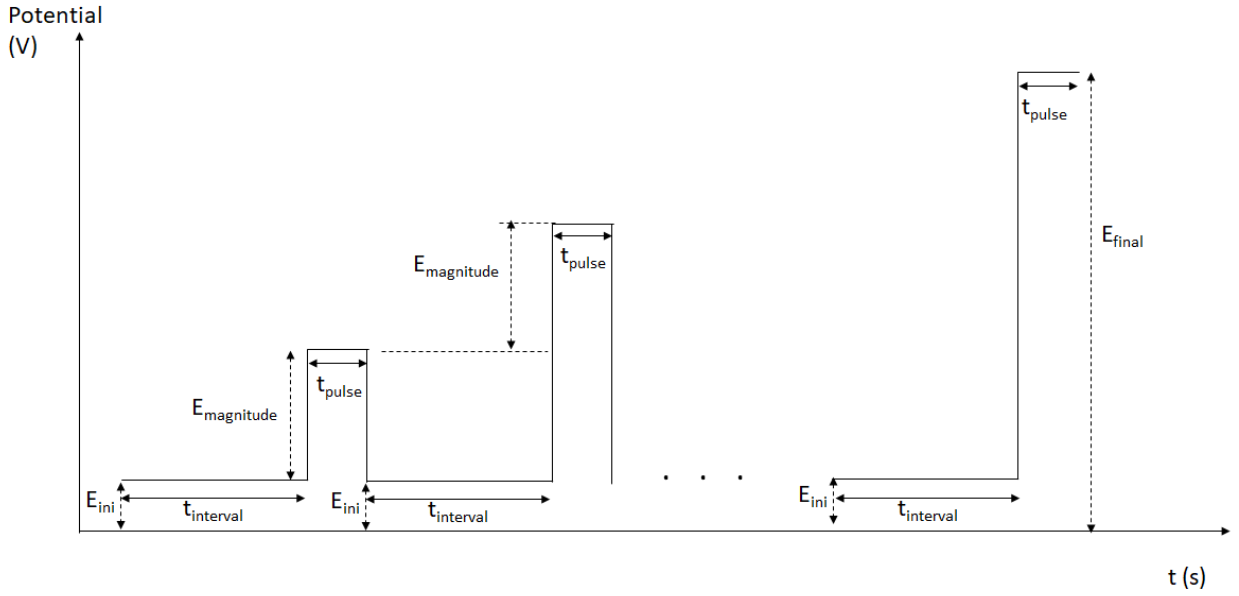


Figure 4 potential excitation wave in Normal Pulse Voltammetry. E_{ini}: initial E; E_{fianl}: final E; $E_{magnitude}$: pulse magnitude; $t_{interval}$: pulse interval; t_{pulse}: pulse width;

Striping Differential Pulse Voltammetry

Deposition Potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Final Potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Step E: any potential between 0.001 V and 0.100 V, increment 0.001V.

Pulse Height: any value between 0.001 V and 0.200 V, increment 0.001V

Pulse Width: 50ms, unchangeable

Pulse Interval: 100ms, unchangeable

Deposition Time: integer number between 1 and 100 increment 1.

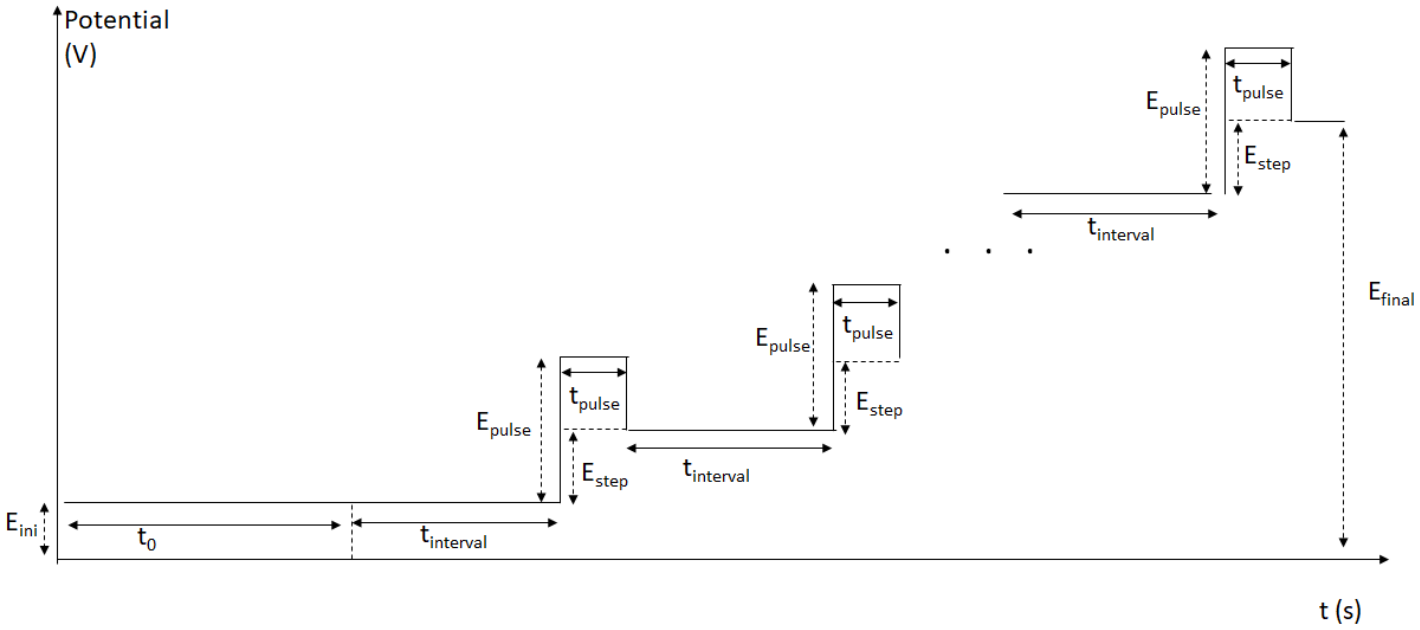


Figure 5 potential excitation wave in Stripping Differential Pulse Voltammetry. E_{ini}: deposition potential; E_{fianl}: final potential; E_{step}: step E; E_{pulse}: pulse height; $t_{interval}$: pulse interval; t_{pulse}: pulse width; t_0: deposition time

Striping Linear Scan Voltammetry

Deposition Potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Final Potential: any potential between -2.5V and 2.5V, increment or decrement 0.001V.

Scan Rate: any value between 0.0005V/s to 1.0 V/s, increment 0.0005V/s

Deposition Time: integer number between 1 and 100 increment 1.

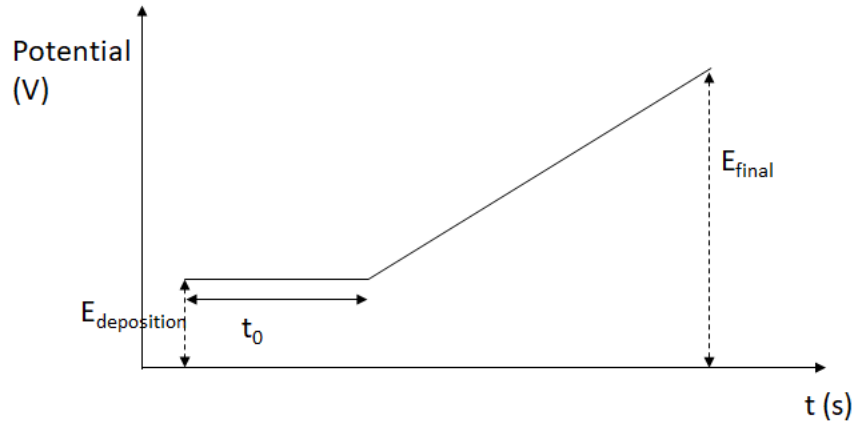


Figure 6 potential excitation wave in Stripping Linear Scan Voltammetry. $E_{deposition}$: deposition potential; E_{fianl}: final potential; t_0: deposition time